

Raising Rabbits in Hawaii

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Cooperative Extension Service · College of Tropical Agriculture & Human Resources
University of Hawaii at Manoa · CIRCULAR 499

Library of Congress Cataloging in Publication Data

Vogt, Dale William,
Raising rabbits in Hawaii.

(Circular, ISSN 0073-1161 ; 499)

Bibliography: p.

1. Rabbits. 2. Rabbits--Hawaii. I. Title.

II. Series: Circular (Hawaii Institute of Tropical
Agriculture and Human Resources) ;

SF453.V58

636'.9322

81-13307

AACR2

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RAISING RABBITS IN HAWAII

D. W. Vogt*

INTRODUCTION

Domestic rabbits can be raised on any scale from a small backyard enterprise with a buck (male) and a few does (females) to a large commercial operation with hundreds of breeding animals. The increased cost of meat, along with the relative ease of starting a small rabbitry, has stimulated interest in raising rabbits for meat in Hawaii.

Rabbits are also needed for a variety of research programs in university and hospital laboratories and for youth projects in 4-H, Future Farmers of America, and scouting programs. They are also popular as pets and with persons wanting to raise and breed animals for show.

This circular is intended to answer many of the questions that are commonly asked by people interested in raising and breeding rabbits.

CHOOSING BREEDING STOCK

There are 37 breeds of rabbit listed by the American Rabbit Breeders Association (ARBA) in its 1976-1980 book on standards of perfection. Most breeds are further divided into varieties. Choose a breed, or a variety within a breed, to fit the purpose for which your rabbits are intended. Because there is usually more than one breed or variety suited for the same purpose, consider the relative availability of comparable breeds as well as your personal preference.

Names and addresses of individuals selling breeding stock from the many breeds and varieties are given in the *ARBA Yearbook*. Information concerning this national organization may be obtained by writing to:

The American Rabbit Breeders Association, Inc.
2401 E. Oakland Avenue
Bloomington, Illinois 61701

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Any breeding stock you choose should be alert and healthy, and from a herd with the qualities you want in your own animals. Buy your rabbits from a breeder who keeps accurate breeding and performance records and raises his animals under sanitary conditions.

HOUSING AND EQUIPMENT

Housing for rabbits, to be adequate, must provide them with suitable-sized quarters that are draft-free yet well ventilated, adequately shaded, dry, and secure from attacks by animals that will do them harm (e.g., dogs, cats, rats, mongooses). This latter requirement is difficult to meet unless a building to contain the rabbit cages is available. Under most circumstances this may not be practical. In those cases, hutch construction should also take into consideration the amount of protection it affords against predatory animals. Obviously, some control must also be exercised over such animals to discourage their predatory behavior.

Cages

Separate cages must be provided for each breeder doe and buck. Individual hutches with a minimum floor space of about 7.5 sq ft (2.5' × 3.0') and a height of 15"-18" should be provided for each breeder doe. Individual cages for breeder bucks may be slightly smaller (5-6 sq ft of floor space) since they don't need to house a growing litter as is the case with the doe.

Actual cage construction will vary depending on whether or not the cages will be given protection from wind and rain. If such protection is afforded, cages may be constructed entirely of wire. Where protection from wind and rain is not otherwise provided, cages should be constructed of wood with fronts and floors of wire. Wire floors should be of 1" × ½" welded wire; openings this size permit feces to drop through and yet present very little problem with young rabbits getting their legs stuck. Roll-down covers should be available to cover wire fronts to protect animals from blowing rain.

Excellent detailed hutch construction plans are provided in USDA Plan No. 6137 entitled "Hutches for Rabbits." Copies may be obtained by contacting the Extension Agricultural Engineer in the Agricultural Engineering Department at the University of Hawaii.

Feed Containers

Pelleted feed can be fed in a wide variety of containers. Ideally the container is large enough to hold a day's supply of feed, resists tipping, and discourages young animals from sitting on it and contaminating the feed.

A variety of commercially manufactured self-feeders may be purchased from feed dealers. These are generally good and efficient.

A number of types of homemade feed cups have been used in the University of Hawaii experimental rabbit colony. The one now in use (Fig. 1) has been found to be quite good from the standpoint that very little feed is wasted—through either spilling or contamination. It does require that more than one such cup be used in hutches containing a doe and her litter. It consists of a metal cylinder open at both ends (about 4 3/8" diameter) fastened to the wire floor of the cage, and a metal inner cup (about 4" diameter) that drops into the cylinder. The top edge of the inner cup is 1/2"–1" below the top edge of the cylinder, making it difficult for the rabbit to pull it out and spill the feed. It is also small enough that even younger rabbits do not often sit on and contaminate the feed.

If hay or a green feed is to be fed, it is desirable to include a manger in the hutch. Hay or green feed placed on the hutch floor will be contaminated and wasted in a very short time. Much less wastage results when roughages are fed from a manger that keeps such feeds off the floor and prevents the animals from contaminating it.

One manger can be made to serve two hutches by building it between hutches. Guard rails should be placed on the manger just far enough apart to permit adults to eat but close enough to prevent younger animals from climbing into it. The USDA Hutch Construction Plan No. 6137 mentioned under "Housing" includes a built-in manger.

Watering Equipment

It is essential that clean, fresh water be available to the rabbits at all times. Restricting the animal's level of water intake has an adverse effect on its health and well-being, and very definitely reduces its growth performance.

Where large numbers of rabbits are involved, an automatic watering system is a must. An automatic system reduces labor costs and ensures



Figure 1. A homemade feed cup used at the University of Hawaii.

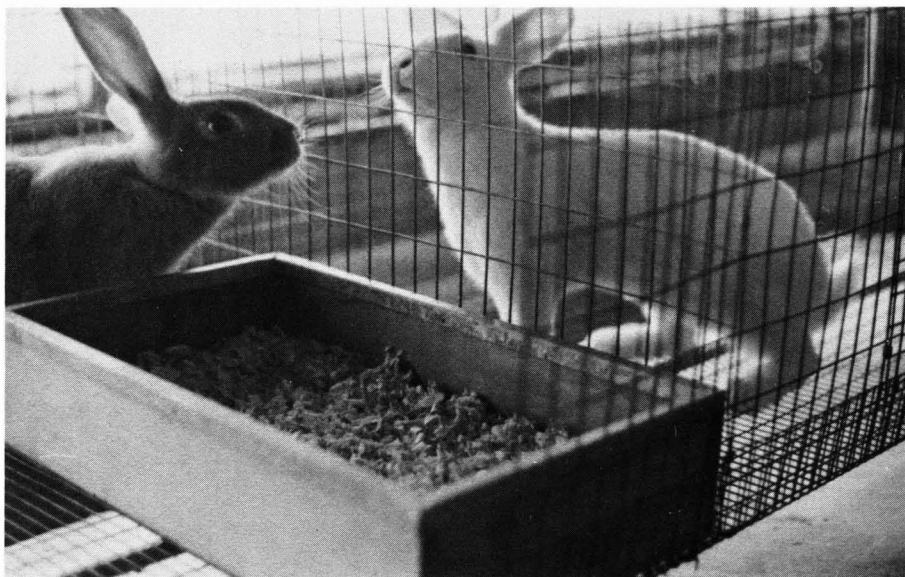


Figure 2. A wooden nest box with metal-covered edges to prevent gnawing.

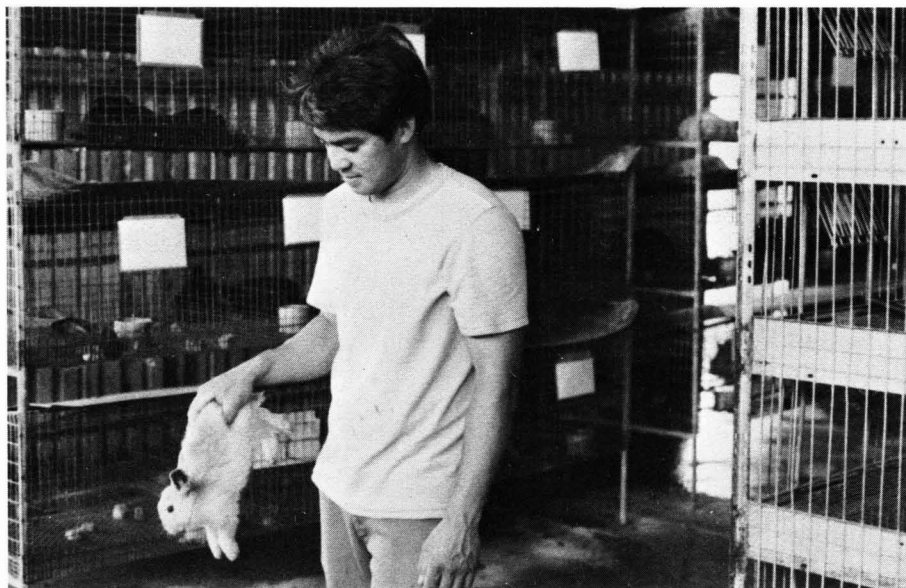


Figure 3. Carrying a young rabbit.



Figure 4. Carrying a heavier rabbit.

all animals a constant and plentiful supply of clean water. The rabbit facility at the University of Hawaii has an automatic system that takes water directly from the main line but with water pressure reduced by means of a variable pressure-regulating valve. Water under reduced pressure flows through $\frac{1}{2}$ " water pipes extending behind each cage. Automatic water valves extend from these $\frac{1}{2}$ " water pipes through the rear of each cage at a height of 6"-7" above the cage floor for easy access by young rabbits.

Where only small numbers of animals are being kept and the operator wishes to hand-water the animals, a container large enough to hold a 24-hour supply of water and heavy enough to resist tipping should be used. Heavy porcelain crocks 5"-6" in diameter and holding $1\frac{1}{2}$ -2 pt of water are satisfactory.

Nest Boxes

A wooden nest box should be provided to the doe about 3 days before she is due to kindle, and removed when the young are 3-4 weeks of age. Figure 2 shows the type being used in the experimental rabbit colony at the University of Hawaii. It is 5" deep \times 11" wide \times 18" long, with metal-covered edges to prevent gnawing.

Does will generally pull fur from their breast and sides prior to kindling to line the nest box. Nevertheless, it is a good practice to provide enough bedding material, such as dry wood shavings (not fine or dusty material) or shredded paper, to cover the floor of the nest box to a depth of about 2". Soiled bedding material should be replaced as necessary to keep the nest box clean and dry.

Nest boxes removed from the hutch should be washed with a detergent, rinsed, and dried thoroughly in the sun.

CARE OF RABBITS

Handling Rabbits

Rabbits should not be lifted or carried by the ears or legs. Doing so may result in injury to the animal. Young, lightweight animals may be carried by gripping them gently about the loin as shown in Figure 3. Heavier animals should be carried by gripping the skin on the back of the neck and shoulders with one hand and providing support with the other hand by placing it under the animal's rump as in Figure 4. Ani-



Figure 5. Carrying a struggling rabbit.

imals that struggle and scratch while being handled in this manner most often are content to be carried with their head under one's arm as shown in Figure 5.

Clipping Toenails

Under the usual confined conditions, the rabbit's toenails do not wear down properly. Growth of the toenails is continuous and they become long, pointed, and sharp. If they become snagged the animal may injure itself in trying to get free. Obviously, they may also cause injury to the handler. For these reasons, it is desirable to clip the toenails periodically.

An inexpensive animal nail clipper may be purchased from any pet supply store. In cutting the nails, care should be taken not to cut into the quick, which contains both nerves and blood vessels. The quick is easily seen as a cone-shaped area of a color different from the rest of the toenail. The toenail should be clipped just forward of the tip of this cone-shaped area.

Special Care During Warm Weather

In Hawaii, climatic conditions are generally not extreme enough to cause rabbits to show symptoms of being overheated. Occasionally, however, animals in the University of Hawaii rabbitry have been observed to show stress symptoms under combined conditions of high temperature and high humidity.

Most susceptible to heat stress are newborn litters and pregnant does. Animals confined by their age (birth to 2 or 3 weeks) to the nest box show stress from uncomfortably warm conditions by constantly moving about in the box. When this occurs, relief from the heat may be provided by transferring the young to a cooling basket suspended within the hutch. The cooling basket may be constructed of 1/8" mesh hardware cloth with dimensions similar to those of the nest box. The young, of course, must be returned to the nest box for morning and evening nursing periods. Heat stress in older animals is indicated by rapid breathing and by an accumulation of moisture around their nose and mouth. Such animals must be provided a means of cooling themselves. A practical solution would be to place against them an ice-filled bag or jar, or to provide them a cold, water-moistened burlap bag to lie upon.

FEEDS AND FEEDING

Feed is the largest single expense in raising rabbits. The adequacy of the ration the animal receives greatly influences its health and rate and efficiency of growth.

Nutritional requirements vary according to the animal's special needs (especially lactation and pregnancy) and age (stage of growth). Within these various classifications individual nutritional requirements also vary.

Specific recommendations for *total digestible nutrients* (TDN), *crude protein* (CP), *crude fiber* (CF), and *fat*—as a percentage of the total ration—for four animal classifications are as follows:

Table 1. Recommended nutrients for rabbits

Animal Classification	Percentage of Total Ration			
	TDN	CP	CF	Fat
Herd bucks and non-pregnant, non-lactating mature does (maintenance)	55	12	14	2
Developing young (growth from approximately 1 to 9 lb body weight)	65	16	10-12	2
Pregnant does	58	15	10-12	2
Lactating does	70	17	10-12	2

Recommendations from 1977 National Research Council publication entitled "Nutrient Requirements for Rabbits."

Two percent fat is adequate, but optimal levels of fat in rations for domestic rabbits have not been established. Most recommendations are that rabbit rations should contain between 2 and 5.5 percent fat. Some research, however, has shown that rations containing 10-25 percent *vegetable fat* produced faster rates of body weight gain than rations containing only 5 percent vegetable fat.

Salt must be supplied either free choice (spool or small block) or incorporated into the ration. If incorporated into the ration, it should constitute 0.5 percent of the total ration.

Most rabbit producers feed commercially prepared, complete pelleted rations. These rations are convenient but expensive. If the necessary ration ingredients are available (high quality hay, plant protein supplements, cereal grains or cereal grain by-products, and salt), you may wish to develop your own rations. If so, the following sample rations are given.

Sample Rations

Table 2. Rations for herd bucks and non-pregnant, non-lactating mature does

Ration 1		Ration 2	
Ingredient	Pounds	Ingredient	Pounds
Alfalfa hay, early bloom ^a	83.0	Kikuyu grass hay ^{a,b}	65.0
Corn, yellow dent	16.5	Oats, grain	34.5
Salt	0.5	Salt	0.5
Total	100.0	Total	100.0

^aCut and dried to 11–15 percent moisture content.

^bExcellent quality, 6-week regrowth.

Table 3. Rations for developing young (growth from approximately 1 to 9 lb body weight)

Ration 1		Ration 2	
Ingredient	Pounds	Ingredient	Pounds
Alfalfa hay, early bloom ^a	46.0	Pangola grass hay ^{a,c}	41.0
Koa haole leaves ^{a,b}	14.5	Koa haole leaves ^{a,b}	19.5
Corn, yellow dent	19.0	Corn, yellow dent	19.0
Wheat, hard red winter	20.0	Oats, grain	15.0
		Soybean meal	5.0
Salt	0.5	Salt	0.5
Total	100.0	Total	100.0

^aCut and dried to 11–15 percent moisture content.

^bKoa haole, when 20 percent or more of the ration, will lower reproductive efficiency of rabbits.

^cExcellent quality, 3-week regrowth.

Table 4. Rations for pregnant does

Ration 1		Ration 2	
Ingredient	Pounds	Ingredient	Pounds
Alfalfa hay, early bloom ^a	62.0	Kikuyu grass hay ^{a,b}	72.0
Oats, grain	20.0	Barley, Pacific Coast	9.0
Corn, yellow dent	17.5	Corn, yellow dent	9.0
Salt	0.5	Soybean meal	9.5
		Salt	0.5
Total	100.0	Total	100.0

^aCut and dried to 11–15 percent moisture content.

^bExcellent quality, 6-week regrowth.

Table 5. Rations for lactating does

Ration 1		Ration 2	
Ingredient	Pounds	Ingredient	Pounds
Alfalfa hay, early bloom ^a	38.0	Pangola grass hay ^{a,b}	48.0
Wheat, hard red winter	25.0	Wheat, hard red winter	19.0
Corn, yellow dent	25.5	Corn, yellow dent	18.0
Soybean meal	11.0	Soybean meal	14.5
Salt	0.5	Salt	0.5
Total	100.0	Total	100.0

^aCut and dried to 11–15 percent moisture content.

^bExcellent quality, 3-week regrowth.

The amount of any ration that should be provided daily will vary from one animal to the next. This is because nutrient quality of the ration components varies and because the animals themselves vary considerably in size (consider, for example, that mature rabbits will weigh anywhere from about 1½ lb to as much as 18 lb). To be on the safe side, it is best to feed the appropriate ration on demand. If individual animals (herd bucks and does and replacement junior bucks and does) are becoming fat, the amount of the ration they receive should be reduced to prevent their becoming overly fat—a condition conducive to poor reproduction.

Coprophagy

Many rabbit raisers view as abnormal the domestic rabbit's practice of eating its fecal waste (coprophagy). This practice is normal, however, and occurs in all breeds of domestic rabbits.

The practice of re-ingesting the soft fecal material that is eliminated at night is quite beneficial. A second passage of the "feed" through the digestive system allows further digestion of fiber and other nutritional feed components. Additionally, it increases the amounts of most B vitamins present in the feed through fermentation in the large intestine.

BREEDING

Age to Breed

Age at sexual maturity varies considerably among the many breeds of rabbits. There are also differences in age at sexual maturity among individuals of the same breed. Their size, relative to the accepted average mature weights for their breed, and their flesh condition are important factors in determining the age at which they might be bred. It should be remembered that general statements made concerning the age at which animals might be bred will not apply to all animals in any given breed; ages mentioned are given as guides only.

In general, smaller breeds such as the Dutch and Polish can be mated at about 4 months of age; medium-sized breeds like the Californian and New Zealand at 6 months of age; and heavy breeds like the Flemish Giant at about 9 months of age.

Receptivity of Doe

Does do not show a clear-cut heat cycle with eggs spontaneously shed (ovulation) at regular intervals, as is characteristic of most domestic animals. Instead, ovulation in the rabbit is stimulated by the act of mating and occurs beginning 10–13 hours after coitus.

There are physical signs that indicate when a doe will readily accept service by a buck. These include a keen interest in animals in adjoining cages, rubbing her chin on the cage or equipment, restlessness, and a congested, moist, purplish-tinged vulva. It is not necessary, however, to wait for these physical indications before mating. A mating schedule (such as one of the following) can be developed and followed with only a few limitations.

Some Possible Breeding Schedules

In following any breeding program, it is necessary to take into consideration the condition of the doe. If she is in good flesh at the scheduled breeding time, she should be mated. If she is thin, it would be desirable to delay mating until she is in satisfactory condition.

In each of the following schedules, a weaning age of 8 weeks is used.

Four litters per doe per year. Four litters can be produced annually by breeding the doe on the day her litter is weaned. Following this schedule, a new litter will be produced about every 87 days.

Five litters per doe per year. A doe can produce five litters each year if she is mated when each successive litter is 6 weeks old. This means that with a weaning age of 8 weeks, the doe will have a rest period between litters of about 17 days. Under this schedule, a new litter will be produced about every 73 days.

Breeding schedules to produce in excess of five litters per year can be worked out, but these require that litters be weaned earlier than 8 weeks of age. Under this circumstance, housing and feeding programs for the early-weaned young would need to be modified.

A healthy doe, on the average, will have a productive life of about 3 years. Under the breeding schedules above, then, she should be expected to produce 12–15 litters during her productive life.

Mating Procedures

The doe should always be placed in the buck's cage for mating. A male placed in the female's cage will sometimes spend much time examining the new cage or, worse yet, the doe may attack him in defense of her territory.

If the doe is receptive when she is put in the buck's cage, mating will occur quickly. A completed mating is indicated when the buck falls over on his back or side after mounting the doe. After mating, the doe should be returned to her hutch.

Does that refuse service within a few minutes should be removed and mating attempted the following day. Sometimes a doe will refuse service by one buck but will readily accept another. If a doe refuses service, try mating her to another buck if one is available. An alternative to mating a reluctant doe is to force-mate her. To do this, restrain the doe by gripping the skin on the back of the neck with one hand and elevating her hindquarters with the other as shown in Figure 6. In this position, with one finger on each side of the vulva and slight forward pressure, the doe's tail will be moved up on her back. This will allow her to be mated.



Figure 6. Holding a doe for force-mating.

Length of Gestation

The average length of time between mating and kindling in domestic rabbits is 31 days. This will vary a little for a number of reasons including breed of rabbit and the size of the litter being carried. In the University of Hawaii rabbit colony, the average length of gestation is 31 days with a range from 29 to 33 days.

Kindling

Kindling is the process of giving birth in rabbits. It generally occurs at night. For the first couple of days after kindling, the doe will usually be nervous and easily disturbed. It is best then to leave her alone except to insure that she has feed and water. The new litter should be inspected 36–48 hours after kindling and any dead or deformed young removed. Before doing this, give the doe some fresh greens to divert her attention from the nest box.

A doe can generally raise up to 10 young. If she delivers more than this, and if a second doe with a smaller litter of about the same age (within 3 days of age) is available, it is possible to transfer young from the larger to the smaller litter (fostering). No distinction will be made by the foster doe because of odor differences in the young.

Often a doe will deliver her young outside the nest box. This occurs most frequently with does having their first litters. When this occurs, it is necessary to place the young in the nest box since the doe apparently will not do this herself.

False Pregnancy (Pseudopregnancy)

False pregnancy occurs in domestic rabbits when ovulated egg cells are *not* fertilized. Ovulation in rabbits is induced by the act of mating and will occur after mating with either a fertile or a sterile buck or following simulated matings occurring when does are housed in the same cage.

Pseudopregnancy persists for about 17 days. During this time the doe is unable to become pregnant even if copulation with a normal male occurs.

Does that have undergone a false pregnancy can usually be successfully bred within 1–4 days following the end of this approximately 17-day period.

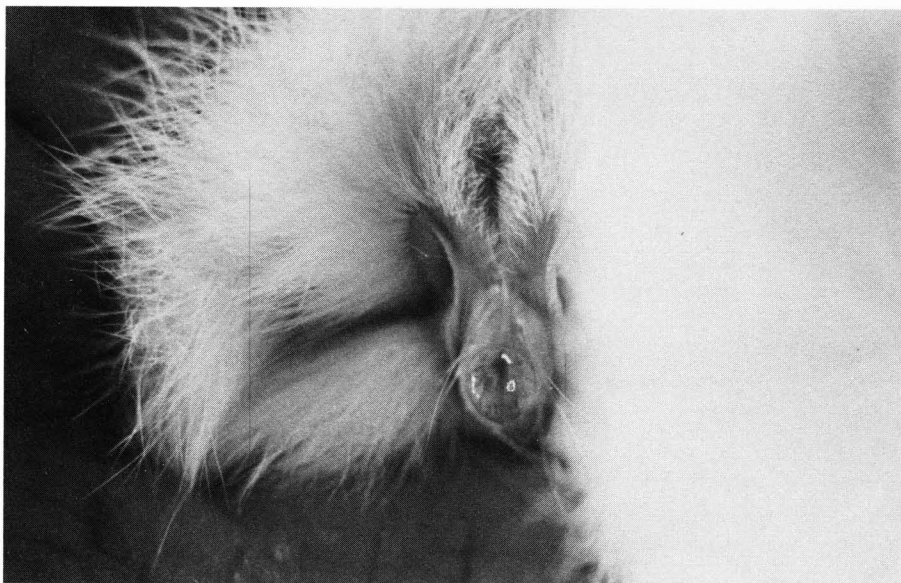


Figure 7a. In a weanling male, the sexual aperture forms a round protrusion.



Figure 7b. In the female weanling, the sexual aperture forms a slit.

Sex Determination

Rabbits should be separated at or shortly after weaning at 8 weeks of age. Young bucks, especially, will soon begin to fight and may injure one another if left together; young does might be bred by a litter-mate male at an earlier age than is desirable.

The sex of the young rabbits can be determined with reasonable ease by the time they are one week of age. By weaning age, when they should be separated, their sex is easily determined. To differentiate between a male and a female, the sexual aperture can be pressed open and identified as follows. Turn the animal on its back and gently restrain it. With the index and middle fingers, push the tail down and toward the animal's back. With the thumb of the same hand in a position slightly forward of the sexual aperture, exert just enough pressure to expose the reddish mucous membrane. In the weanling male (Figure 7a), the sexual aperture will form a round protrusion; in the female (Figure 7b), it will form a slit extending nearly to the anal opening.

KEEPING RECORDS

Keeping records requires that individual animals be identified in some way. An ear tattoo (Figure 8) is a good method of identification because it is permanent, easily and quickly accomplished, and results in no disfiguration.

The tattoo coding system used in the University of Hawaii experimental rabbit colony uses a 5-digit tattoo set. The first digit is an alphabetical letter to designate the generation in which the animal is born. The second and third digits are numerical values and identify the litter number. The fourth and fifth digits are also numerical values and indicate the individual rabbit within the litter. The tattoo shown in Figure 8, G78 4, for example, identifies rabbit number 4 in litter number 78 in generation G (generation 7). The space between the numbers 8 and 4 is the fourth-digit position and is interpreted as a zero.

A sample hutch card and 2 record sheets for individual breeding bucks and does are shown in Figures 9, 10, and 11. Information to be kept relates to breeding, kindling, and weaning performance. Records of this kind are most useful in making decisions regarding the culling of unproductive breeding animals and the selection of young replacement stock for the breeding herd.



Figure 8. An ear tattoo is a permanent way of identifying individual rabbits.

<p>Doe No.: _____</p> <p>Bred by Buck No.: _____ Date: _____ Expected Kindling Date: _____</p> <p>Bred by Buck No.: _____ Date: _____ Expected Kindling Date: _____</p> <p>Bred by Buck No.: _____ Date: _____ Expected Kindling Date: _____</p> <p>Date Kindled: _____ No. Born Alive: _____ No. Born Dead: _____</p> <p>Litter No.: _____</p>		
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Figure 9. Hutch breeding and kindling record.

Buck's Name or Number: _____ Date Born: _____ No. Teats: L _____ R _____ Breed: _____

Disposal: _____ Disposal Date: _____

Litter Records

Dam		Date of Breeding	Date Kindled	Litter No.	No. Kindled	Date Weaned	Weaning Age (Days)	Individual Bunny Records											
No.	Breed							No.	Sex	Weaning Wt.	No.	Sex	Weaning Wt.	No.	Sex	Weaning Wt.	No.	Sex	Weaning Wt.
		1.						1			5			9					
		2.						2			6			10					
		3.						3			7			Total					
								4			8			Average					
		1.						1			5			9					
		2.						2			6			10					
		3.						3			7			Total					
								4			8			Average					
		1.						1			5			9					
		2.						2			6			10					
		3.						3			7			Total					
								4			8			Average					
		1.						1			5			9					
		2.						2			6			10					
		3.						3			7			Total					
								4			8			Average					
		1.						1			5			9					
		2.						2			6			10					
		3.						3			7			Total					
								4			8			Average					

Remarks:

Figure 10. Buck's production record.

Doe's Name or Number: _____ Date Born: _____ No. Functional Teats: L _____ R _____ Breed: _____

Disposal: _____

Disposal Date: _____

Litter Records

Sire		Date of Breeding	Date Kindled	Litter No.	No. Kindled	Date Weaned	Weaning Age (Days)	Individual Bunny Records								
No.	Breed							No.	Sex	Weaning Wt.	No.	Sex	Weaning Wt.	No.	Sex	Weaning Wt.
		1.						1			5			9		
		2								6			10			
		3								7			Total			
		4								8			Average			
		1.						1			5			9		
		2								6			10			
		3								7			Total			
		4								8			Average			
		1.						1			5			9		
		2								6			10			
		3								7			Total			
		4								8			Average			
		1.						1			5			9		
		2								6			10			
		3								7			Total			
		4								8			Average			
		1.						1			5			9		
		2								6			10			
		3								7			Total			
		4								8			Average			
		1.						1			5			9		
		2								6			10			
		3								7			Total			
		4								8			Average			

Remarks:

Figure 11. Doe's production record.

DISEASES

Rabbits are subject to a wide variety of diseases that cause death and decrease the performance of the survivors. These diseases may be infectious, parasitic, nutritional, genetic, or a combination of these factors.

Most diseases can be avoided through good breeding and management practices. A healthy animal is alert and active, and has good flesh with a smooth coat; its droppings are round and firm. Daily observation of the animals is requisite to noting the first sign of disease.

A thorough review of rabbit diseases is not within the scope of this publication. Some of the diseases that one might encounter in raising domestic rabbits in Hawaii are as follows.

Boils (Subcutaneous Abscesses)

Subcutaneous abscesses (Figure 12a) are caused by bacteria and appear as swellings of various sizes under the skin of the rabbit. (Abscesses may also occur in any of the internal organs or tissues.) The swellings may be either firm or soft. These swollen areas contain an off-white creamy material with the consistency of toothpaste (Figure 12b).

Researchers have identified the responsible organism to be a bacterium, *Pasteurella multocida*. The bacteria reach the consequently infected location either internally through the blood or lymphatic systems or externally through injuries such as bites, scratches, or punctures from sharp objects within the cage.

Affected animals show weight losses or reduced growth rates and high death rates. Unless the animal is valuable as breeding stock, it should be destroyed and burned or buried deeply. Affected animals have been treated successfully at the University of Hawaii experimental colony by opening and draining the abscessed areas, cleaning the drained areas with antiseptics such as Lugol's or Betadine solutions, and injecting the animal with an antibiotic combination of penicillin and streptomycin.

Buck Teeth, Walrus Teeth, or Wolf Teeth (Malocclusion)

Buck teeth (Figure 13a) is a very commonly occurring disease in domestic rabbits. Age of onset for this disease is variable. It can be



Figure 12a. Subcutaneous abscesses are swellings under the skin.



Figure 12b. The swellings contain a creamy material.

detected in most cases as early as 4 weeks of age and in others may not manifest itself until 6 or 7 months of age. In still other cases, pre-weaning-age maloccluded animals have been observed to eventually develop normally occluded teeth. The upper and lower large incisors normally grow throughout the lifetime of the rabbit. In rabbits that *do not* have buck teeth, the upper and lower large incisors are positioned in such a way (Figure 13b) that their normal growth is kept in check by normal wear during the chewing process. If these incisors are positioned improperly (Figure 13c), normal wear does not occur, with the result that they grow to abnormal lengths.

The practical difficulty associated with this defect is that it interferes with the animal's ability to eat and, of course, adversely affects its growth. The large incisors may be cut, but since they continue to grow this process would need to be repeated periodically.

Improper positioning of the incisors has both hereditary and non-hereditary causes. Because the defect usually has a hereditary basis, it is wise to avoid using affected animals, their parents, and their sibs (brothers and sisters) as breeders.

Colds or Snuffles

Snuffles (Figure 14) is a very commonly observed bacterial disease in domestic rabbits. Affected animals sneeze often and show a clear to whitish or yellow discharge from the nasal passages. The fur on the insides of the animal's front legs may be matted from rubbing its nose.

The bacteria responsible for this disease, *Pasteurella multocida*, are reportedly carried in the nasal passages of not only affected animals but many apparently healthy animals as well (Weber, 1924). The disease occurs when the animal's resistance is lowered through the imposition of such stress factors as an inadequate diet or the animal's becoming wet and chilled. The disease is spread by contact between animals, by contaminated equipment, or by airborne means (Weber, 1924).

Treatment with antibiotics and sulfaquinoxaline is effective in the sense that the symptoms of the disease may disappear, but they often recur when such treatment is stopped. Prevention of this clinical condition through good sanitary procedures and avoidance of stress factors seems to be the most reasonable tactic at present in coping with snuffles.



Figure 13a. Malocclusion, or buck teeth, is a common disease among domestic rabbits.

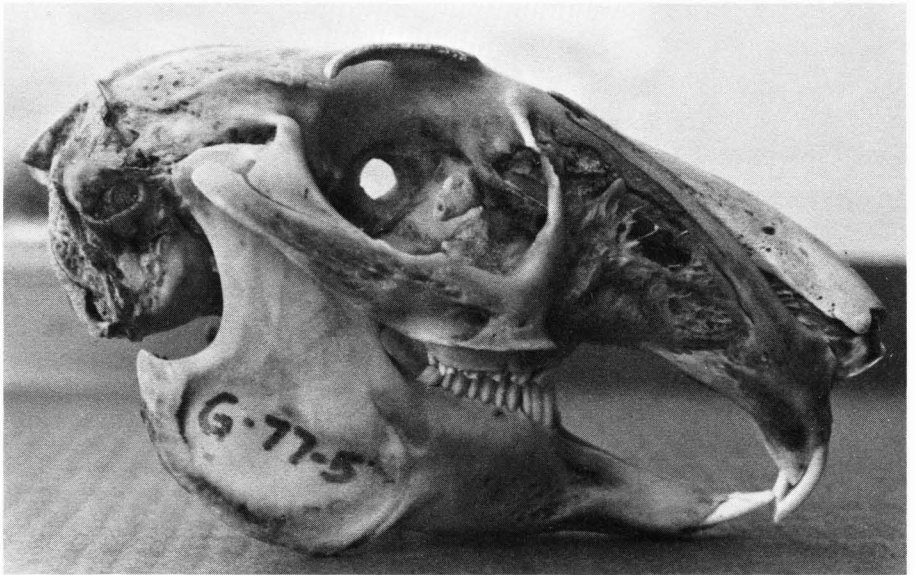


Figure 13b. Position of the incisors in a normal rabbit keeps normal growth in check by normal wear during the chewing process.

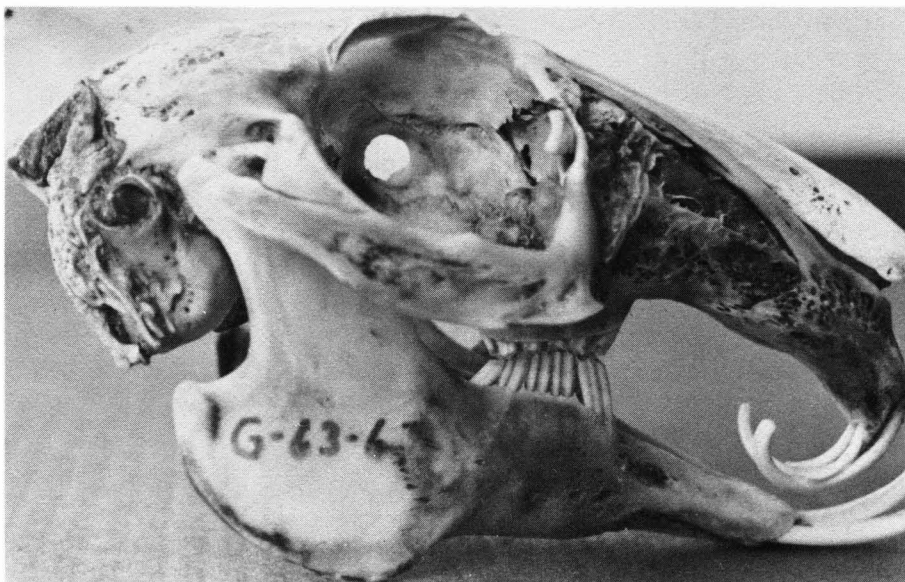


Figure 13c. Improper position of incisors permits their growth to abnormal lengths.

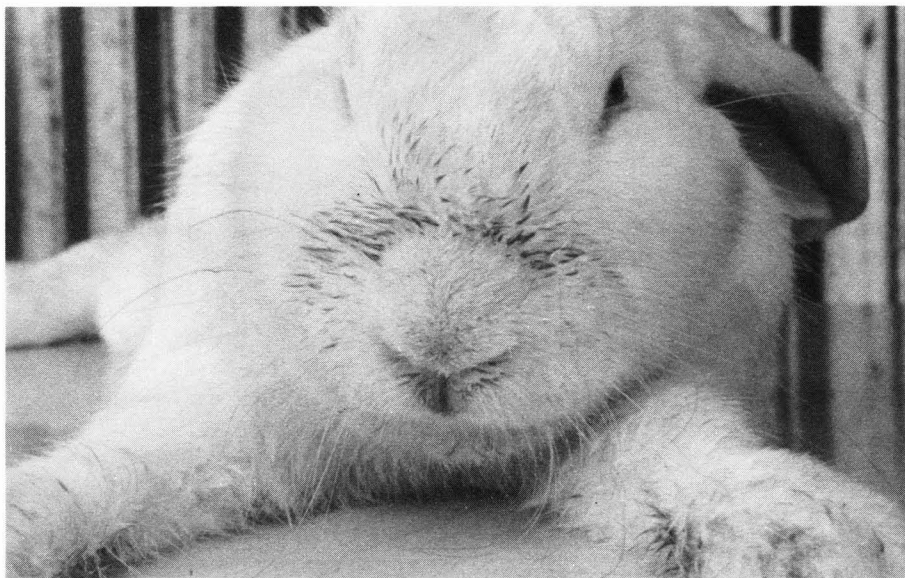


Figure 14. Snuffles is a common bacterial disease.

Ear Canker or Ear Mange

This is undoubtedly the most common of the diseases caused by external parasites. It is caused by an infestation of a mite with the technical name *Psoroptes cuniculi*. The mite chews the outer surface of skin on the inside of the ear, causing redness, irritation, and soreness. Ear mite infestation is first indicated by the rabbit's scratching at its head and ears with its hind feet. A whitish to tan crusty material soon becomes evident in the ears, increasing as the infestation continues (Figure 15).

Effective treatment consists of liberal swabbing of the ears (inside and outside), head, and neck with mineral or vegetable oil or an insecticidal oil preparation used in the treatment of this same condition in dogs and cats. This treatment should be repeated within 7 to 10 days. Rabbits coming in contact with the affected rabbit should be similarly treated. Cages and equipment used by the affected animals should be cleaned and disinfected.

Pin Worms

Rabbit pin worms are a common internal parasite of domestic rabbits. Adult worms are white, threadlike, and from $\frac{1}{4}$ to $\frac{1}{2}$ " long. They are found in the cecum and large intestine.

Although the presence of these worms is apparently not associated with reduced weight gains or sickness, it may be desirable to treat animals infested with them. A highly effective treatment (Festisov, 1968) is to administer piperazine adipate once daily for 2 days in the food or water. Dosage levels are 0.5 g per kg body weight for adult rabbits and 0.75 g per kg body weight for young rabbits.

Ringworm

Ringworm is a fungus infection of the skin caused by dermatophytic fungi, most commonly *Trichophyton mentagrophytes*. The infection may appear on any area of the skin. The affected site is round or nearly so, of variable size from about 2 to 20 mm in diameter, slightly raised, and pink with an accumulation of scaly, flaky whitish material. The fur falls out in these areas and may be thin or absent.

Ringworm in rabbits can be spread not only to other rabbits but to man and other animal species as well. For this reason, care must be



Figure 15. A tan crust in the ears is a symptom of ear mite infestation, or ear mange.



Figure 16. Sore hocks are common among medium-sized and large breeds of rabbit.

taken in handling affected animals. If treatment of affected animals is attempted, the caretaker should wear gloves and clothes that can be sterilized by boiling. Treatment consists of application of a fungicidal preparation. Cages and all equipment coming in contact with the diseased animal should be cleaned and disinfected.

Sore Hocks

Sore hocks (Figure 16) is a commonly observed disease in the medium-sized and large breeds of rabbits. The sores are essentially round, ulcerated areas on the foot pads, covered by a dry, hard scab. They apparently result from excessive pressure on the tissues of the foot pad. In addition to heavy body weights, unsanitary cage conditions and hard flooring (especially wire flooring) contribute to the development of this disease.

Application of an iodine ointment to the affected area is generally effective in combating the problem. It is also helpful to provide affected animals with clean, soft bedding materials to reduce the pressure on the affected parts.

Weepy Eye (Conjunctivitis)

Weepy eye (Figure 17) is a commonly occurring disease in domestic rabbits of all ages. As the name suggests, there is a watery discharge (overflow of tears) that wets the fur on the animal's cheeks. In some cases, especially pre-weaning-age animals, the eyelids may be swollen and glued shut.

Weepy eye can be caused by the bacterium *Pasteurella multocida* but may be caused by other factors as well. Recommended treatment consists of application of an ophthalmic ointment containing antibiotics such as penicillin or chloramphenicol (Weisbroth et al., 1974).

Wry Neck

Wry neck is a commonly occurring disease in domestic rabbit colonies. The common name for the disease comes from the observation that the afflicted animal has its head twisted to one side (Figure 18). In most severe cases, the animal may roll over in the direction of its head and be unable to get back on its feet. In such cases, the animal



Figure 17. Weepy eye is treated with an antibiotic ointment.



Figure 18. A rabbit with wry neck should be destroyed before others are infected.

also experiences weight loss from its inability to eat and drink adequately.

Most commonly, the causative agent is the bacterium *Pasteurella multocida*. Other bacteria (chiefly *Staphylococcus* and *Bordetella*) may also be implicated (Fox et al., 1971).

Little information is available concerning treatment for wry neck. Since affected animals are carriers of the causative bacteria, it is recommended that they be destroyed and burned or buried deeply.

SLAUGHTERING AND DRESSING

At weaning age, the young in meat breeds weigh about 3½–4½ lb each—a suitable size for slaughter as fryers. Some producers may wish to hold off slaughtering until 9 or 10 weeks of age, at which time the young will have gained an additional ½ to 1¼ lb. These, of course, are average figures for meat rabbits and can be very much affected by a number of factors—the most important of which are breed of rabbit, size of litter, health, and quality and amount of feed.

Animals should receive water but no feed during the 12 to 15 hours immediately preceding slaughter.

Domestic rabbits are usually slaughtered in one of two accepted ways. The preferred method, if one is proficient, is to first dislocate the animal's neck, rendering it immediately unconscious, followed by quick removal of the head. To dislocate the rabbit's neck, with one hand hold the animal upside down by the back legs. Place the thumb of the free hand on the back of its neck and the fingers under the chin. Stretch the neck and then dislocate it by quickly pulling upward and backward on the chin while maintaining the downward pressure on the back of the head with the thumb. If this method is to be used, it is recommended that it first be demonstrated by someone proficient in it to avoid needless suffering on the part of the animal. After dislocating the neck, the animal should be suspended by a hind leg by either a cord loop or by a hook inserted between the tendon and bone just above the hock. The head should be severed from the body immediately to permit rapid and thorough bleeding.

A second slaughter method is to hold the animal securely upside down, and then render it unconscious by a quick, hard blow to the base of the skull. The head may then be removed as above.

Before skinning, remove the tail, free hind foot, and front feet. Next slit the skin on the inside of each hind leg from the hock to the

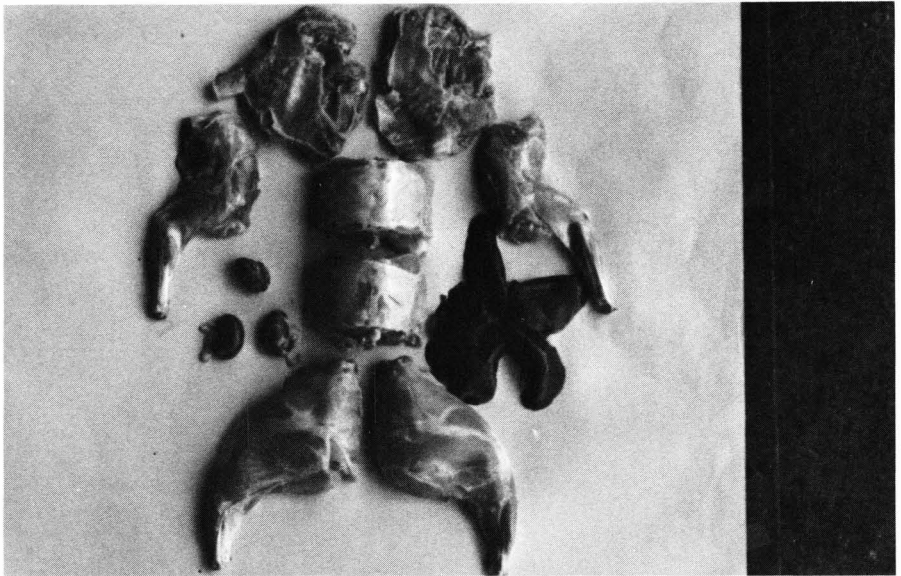


Figure 19. Some common cuts from a rabbit carcass to be eaten.

base of the tail. Around this slit separate the skin from the carcass and then pull the skin downward over the animal.

After the skin is removed, cut the carcass open along the midline of the belly and remove the entrails. Peel the gall bladder from the liver and discard. Place the liver, heart, and kidneys in cold water. Thoroughly wash the carcass in cold water to remove blood and any hair that might be stuck to the carcass. When the carcass is clean, it should be soaked in cold water for 15 to 30 minutes. The carcass may be cut up in a number of ways according to preference. Some common cuts from a rabbit carcass are shown in Figure 19.

Rabbit meat offered for sale to the public does not require federal inspection. Information regarding voluntary federal inspection of rabbits and edible products thereof may be obtained from:

Area Supervisor
4263 Commercial Street, SE
Salem, Oregon 97302

GLOSSARY

buck: a male rabbit
cecum: blind sac forming first part of large intestine
coitus: sexual intercourse
doe: a female rabbit
dress: to prepare meat rabbits for market by bleeding and cleaning
gestation: period between mating and kindling (period of pregnancy)
herd: a group of rabbits kept or bred for human use
hock: heel of rabbit's foot
hutch: pen for confining rabbits or other small animals
incisors: large cutting teeth in front of mouth
kindle: to give birth
litter: multiple offspring produced by one female in one kindling
ovulate: to shed egg cells
sib: sibling; brother or sister
vulva: external female genitalia
wean: to separate young from their mother

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Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Noel P. Kefford, Director of the Institute and Dean of the College, Cooperative Extension Service, College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa, Honolulu, Hawaii 96822. An Equal Opportunity Employer providing programs and services to the citizens of Hawaii without regard to race, color, national origin or sex.

CIRCULAR 499 (09/81)—Reprinted 10/82 (1.5M)

OCT

1982